AD-A190 907 MOBILITY OF SOIL CONTAMINANTS IN AN ECOSYSTEM OF TREES GROWING ON DREDGED.. (U) HOOFDGROEP MAATSCHAPPELIJKE TECHNOLOGIE TNO DELFT (NETHERLAND.. S H KAY ET AL. 1/1

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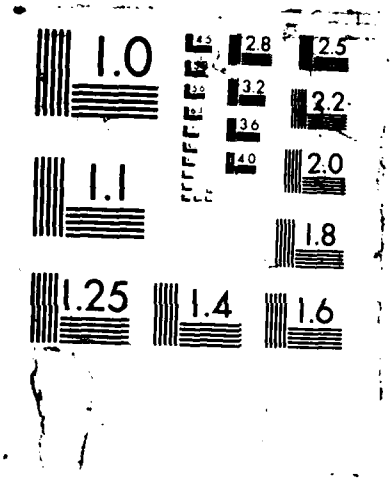
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MOBILITY OF SOIL CONTAMINANTS IN AN ECOSYSTEM OF TREES GROWING ON DREDGED MATERIAL - THE BROEKPOLDER (ROTTERDAM, THE NETHERLANDS)

First interim report, October 1987

Date : 1987-11-04

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1. INTRODUCTION

In 1987 an experimental study was started of the bioavailability of some contaminants in ecosystems growing on dredged material in a dumping site. Standard bioassays (earthworm bioassay with Eisenia foetida and plant bioassay with Cyperus esculentus) were carried out on substrates taken from an 25-year-old disposal site for dredged material, near Rotterdam, on which trees were planted some 15 years ago. Both the anoxic soil layer (resembling an unchanged dredged mud) and the humus-rich, upper soil layer (resembling mature dredged mud) were tested. Part of the Broekpolder was originally selected to see whether trees will grow on dredged material, and three species (Populus, Quercus and Acer) were planted separately in identical plots. Their impact on the mobility of contaminants in the mature humic soil layer is the focal point of this study. Keyword=: Netherlands
The objectives of the project are the following:

1. To compare the results of the standard plant and animal bioassays of unchanged dredged mud with those of mature dredged mud. Changes in mobility of contaminants resulting from metal uptake and humus production by trees, will be investigated.
2. To compare results of the plant bioassay with those of the worm bioassay, and to assess whether or not a combined plant-animal bioassay affords ecologically reliable results in a cost-effective manner.
3. To compare the results of the standard bioassays on mature dredged material with accumulation of contaminants of organisms native to the model disposal site.
4. To assess the impact of tree growth on the mobility of contaminants in the sediment of a mature disposal site.
5. To estimate sources of variance in chemical analysis of plant, animal and substrate samples.

2. PROGRESS

TNO investigators (Drs Martin Scholten and Dr Stratford Kay) and Drs Joop Marquenie (Rijkswaterstaat) conducted a preliminary survey of the Broekpolder disposal site prior to beginning field and laboratory studies. The purpose of this survey was to determine sampling locations and familiarize ourselves with the site.

After the survey, soils were collected from the poplar, oak, maple and elm plots in the experimental forestry plantation. Mineral soils were air-dried and ground for use in the bioassays. Humic soils, however, were not dried or ground in order to preserve biological activity in this soil layer. Subsamples of all soils were oven-dried and ashed. Organic matter and pH were determined.

Greenhouse plant bioassays with Cyperus esculentus were initiated using soils from the humic and oxidized layers from all four tree stands and the anaerobic layers from the poplar, oak, and maple stands. Laboratory earthworms bioassays with Eisenia sp. were initiated on the humic and anaerobic layer soils from the poplar, oak, and maple stands. Combined earthworm-plant bioassays were conducted in both laboratory and greenhouse using the anaerobic soil layer from the poplar stand. All bioassays followed WES protocols as far as possible.

Field studies were also initiated at the disposal site. Leaf litter was collected from the same sampling points concurrently with the soils. An intended comparison between metal uptake in C. esculentus and the native grasses growing at the Broekpolder could not be made, because grasses were essentially absent from all four sampled tree stands (presumably as the result of shading). Earthworms were collected in the vicinity of each sampling point in all four tree stands, as well as in another ("reference area") poplar forest elsewhere in the Broekpolder.
Earthworms in the experimental forest were less numerous than in the "reference" area. Whether this variation is due to soil contaminants is uncertain.

Several side-studies were conducted to analyse the utility and ecological value of the main project. Snails and slugs have been collected from all four tree stands, and archived for possible future chemical analysis. Pit-fall traps were placed in the poplar, oak, and maple stands to assess soil arthropod populations. Perliminary observations suggest that soil arthropod populations may differ among the tree stands.

3. CONTINUATION

Studies remaining to be done include the collection of newly-fallen leaves from each of the tree stands, and chemical analysis of soils and tissue samples. Analytical work will be conducted by the TNO Department of Analytical Chemistry, Delft. Any remaining soil samples and tissues will be archived. Results of field studies and laboratory bioassays will be available in subsequent reports.

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